Remarks begin on page 11 of this paper.

In response to the October 6, 2004 Office Action, please amend the above application as follows:

Amendments To The Claims

The following listing of claims will replace all prior versions and listings of claims in this application. A clean set of the pending claims is attached hereto as **Exhibit A**.

Listing of Claims:

Claims 1-34 (canceled)

35. (currently amended) A method for producing a recombinant [humanized] glycoprotein comprising an N-glycan structure that comprises a $Man_5GlcNAc_2$ glycoform in a lower eukaryotic host cell that does not display [a]alpha-1,6 mannosyltransferase activity with respect to the N-glycan on a glycoprotein, the method comprising the step of introducing into the host cell a nucleic acid encoding a [hybrid] mannosidase enzyme comprising:

(a) a catalytic domain having alpha-1,2 mannosidase activity selected to have a pH optimum within 1.4 pH units of the average pH optimum of glycosylation-related enzymes in a [the] subcellular location where the domain is targeted; and

(b) a cellular targeting signal peptide not normally associated with the catalytic domain selected to target the mannosidase enzyme to the ER or Golgi apparatus of the host cell [catalytic domain to a subcellular location where the domain will exhibit optimal activity];

whereby, upon passage of the recombinant glycoprotein through the ER or Golgi apparatus of the host cell, in excess of 30 mole % of the N-glycan structures attached thereto have a $Man_5GlcNAc_2$ glycoform [structure] that can serve as a substrate for GlcNAc transferase I *in vivo*.

36. – 38. (canceled)

39. (currently amended) The method of claim 35, wherein the mannosidase enzyme is targeted to the early, medial, late Golgi or the trans Golgi network of the host cell.

40. (currently amended) The method of claim 35, further comprising the step of introducing into the host cell one or more additional nucleic acids encoding one or more additional enzymes selected from the group consisting of mannosidases, glycosyltransferases and glycosidases.

41. (canceled)

42. (currently canceled) [The method of claim 35 or 40, wherein the glycoprotein comprises *N*-glycans having fewer than six mannose residues.]

43. (currently canceled) [The method of claim 35 or 40, wherein the glycoprotein comprises *N*-glycans having fewer than four mannose residues.]

44. (currently amended) The method of claim 35 or 40, wherein the recombinant glycoprotein comprising the N-glycan is further modified to comprise [comprises] one or more sugars selected from the group consisting of N-acetylglucosamine, galactose, sialic acid[,] and fucose.

45. (currently amended) The method of claim 35 or 40, wherein the recombinant glycoprotein comprising the N-glycan is further modified to comprise [comprises] at least one oligosaccharide branch comprising the structure NeuNAc-Gal-GlcNAc-Man.

46. (currently amended) The method of any one of claims [claim] 35, [or] 40, 70, 79 or 80, wherein the host is selected from the group consisting of *Pichia pastoris*, *Pichia finlandica*, *Pichia trehalophila*, *Pichia koclamae*, *Pichia membranaefaciens*, *Pichia opuntiae*, *Pichia thermotolerans*, *Pichia salictaria*, *Pichia guercuum*, *Pichia pijperi*, *Pichia stiptis*, *Pichia methanolica*, *Pichia* sp., *Saccharomyces cerevisiae*, *Saccharomyces* sp., *Hansenula polymorpha*, *Kluyveromyces* sp., *Candida albicans*, *Aspergillus nidulans*, and *Trichoderma reesei*.

47. (currently amended) The method of claim 35 or 40, wherein the host further lacks [is deficient in] the activity of one or more enzymes selected from the group consisting of mannosyltransferases and phosphomannosyltransferases.

48. (currently amended) The method of claim 47, wherein the host lacks an enzyme activity with respect to the N-glycan on a glycoprotein, the activity [does not express an enzyme] selected from the group consisting of 1,6 mannosyltransferase; 1,3 mannosyltransferase; and 1,2 mannosyltransferase.

49. (previously amended) The method of claim 35 or 40, wherein the host is an OCH1 mutant of *P. pastoris*.

50. (currently amended) The method of claim 35 or 40, wherein the host is genetically modified to express [expresses] one or more enzymes selected from: GnTI; a UDP-specific diphosphatase; a GDP-specific diphosphatase; and a UDP-GlcNAc [UDP-GlcNac] transporter.

51. (canceled)

52. (currently amended) The method of claim 35 or 40, further comprising the step of isolating the recombinant glycoprotein subsequent to passage of the recombinant glycoprotein through the ER or Golgi apparatus of the host cell [from the host].

53. (previously presented) The method of claim 52, further comprising the step of subjecting the isolated glycoprotein to at least one further glycosylation reaction *in vitro*, subsequent to its isolation from the host.

54. (currently canceled) [The method of claim 35, further comprising the step of introducing into the host cell nucleic acid molecules encoding one or more enzymes for production of the humanized glycoprotein selected from the group consisting of mannosidases, glycosyltransferases and glycosidases.]

55. (canceled)

56. (canceled)

57. (previously amended) The method of claim 35, wherein the mannosidase enzyme has optimal activity at a pH between 5.1 and 8.0.

58. (currently amended) The method of claim 35, wherein the mannosidase enzyme comprises an [α]alpha-1,2-mannosidase catalytic domain [derived] from mouse, human, *Lepidoptera*, *Aspergillus nidulans*, *Xanthomonas manihotas* or *Bacillus* sp.

59. (currently amended) The method of claim 40[54], wherein at least one of the additional enzymes [for production of the humanized protein] is localized in the host by forming a fusion protein between a catalytic domain of the enzyme and a cellular targeting signal peptide.

60. (previously presented) The method of claim 59, wherein the fusion protein is encoded by at least one genetic construct formed by the in-frame ligation of a DNA fragment encoding a cellular targeting signal peptide with a DNA fragment encoding a glycosylation enzyme or catalytically active fragment thereof.

61. (currently amended) The method of claim 59, wherein the catalytic domain encodes a glycosidase or glycosyltransferase selected from [that is derived from a member of] the group consisting of GnT I, GnT II, GnT III, GnT IV, GnT V, GnT VI, GalT, Fucosyltransferase and ST, and wherein the catalytic domain has optimal activity at a pH between 5.1 and 8.0.

62. (currently amended) The method of claim 35[54], further comprising the step of introducing into the host cell one or more additional nucleic acids encoding [wherein the nucleic acid molecule encodes] one or more additional enzymes selected from the group consisting of UDP-GlcNAc transferase, UDP-galactosyltransferase, GDP-fucosyltransferase, CMP-sialyltransferase, UDP-GlcNAc transporter, UDP-galactose transporter, GDP-fucose transporter, CMP-sialic acid transporter, and nucleotide diphosphatases.

63. (currently amended) The method of claim 40[54], wherein the host is genetically modified to express [expresses]GnTI and a UDP-GlcNac transporter.

64. (currently amended) The method of claim 40[54], wherein the host is genetically modified to express [expresses]a UDP- or GDP-specific diphosphatase.

65. (previously presented) The method of claim 40, wherein the one or more additional enzymes is targeted to the endoplasmic reticulum, the early, medial or late Golgi, or the trans Golgi network of the host cell.

66. (previously presented) The method of claim 65, wherein the one or more additional enzymes is targeted by means of a cellular targeting signal peptide not normally associated with the enzyme.

67. (previously presented) The method of claim 40, wherein the one or more additional enzymes is selected to have a pH optimum within 1.4 pH units of the average pH optimum of glycosylation-related enzymes where the enzyme is localized.

68. (currently amended) The method of claim 35 or 40[54], wherein a [at least one]nucleic acid [molecule] encoding one or more enzymes is introduced into the host cell by integration into the host cell chromosome.

69. (currently amended) The method of [any one of claims] claim 40[, 54] or 68, wherein at least one of the encoded enzymes is GnTI.

70. (currently amended) A method for producing a recombinant [humanized] glycoprotein comprising an N-glycan structure that comprises a $GlcNAcMan_5GlcNAc_2$ glycoform in a lower eukaryotic host cell, the cell genetically modified to produce [that produces glycoproteins having]N-glycan structures having[wherein] an excess of 30 mole % of [the N-glycan structures produced within the host cell have]a $Man_5GlcNAc_2$ glycoform [structure] that can serve as a substrate for GlcNAc transferase I *in vivo*, the method comprising the step of

introducing into said host cell a nucleic acid encoding a GlcNAc transferase I [expressing in said host cell a hybrid GnTI]enzyme comprising:

(a) a catalytic domain having GlcNAc transferase I activity selected to have a pH optimum within 1.4 pH units of the average pH optimum of glycosylation-related enzymes in a[the] subcellular location where the domain is targeted; and

(b) a cellular targeting signal peptide not normally associated with the catalytic domain selected to target the GlcNAc transferase I enzyme [catalytic domain to a subcellular location where the domain will exhibit optimal activity] to the ER or Golgi apparatus of the host cell;

whereby, upon passage of the recombinant glycoprotein through the ER or Golgi apparatus of the host cell, a recombinant glycoprotein comprising a $GlcNAcMan_5GlcNAc_2$ glycoform is produced.

71. (currently amended) A method for producing a recombinant [human-like]glycoprotein comprising an N-glycan structure that comprises a $GlcNAcMan_5GlcNAc_2$ glycoform in a lower eukaryotic host cell that does not display alpha-1,6 mannosyltransferase activity with respect to the N-glycan on a glycoprotein, the method comprising the step or steps of introducing into the host cell one or more nucleic acids encoding at least two enzymes, the first [a hybrid N-acetylglucosaminyl transferase]enzyme comprising:

(a) a catalytic domain having alpha-1,2 mannosidase activity selected to have a pH optimum within 1.4 pH units of the average pH optimum of glycosylation-related enzymes in a[the] subcellular location where the domain is targeted; and

(b) a cellular targeting signal peptide not normally associated with the catalytic domain of

(a) and selected to target the [catalytic domain to a subcellular location where the domain will exhibit optimal activity]first enzyme to the ER or Golgi apparatus of the host cell;

the second enzyme comprising:

(c) a catalytic domain having GlcNAc transferase I activity selected to have a pH optimum within 1.4 pH units of the average pH optimum of glycosylation-related enzymes in a subcellular location where the domain is targeted; and

(d) a cellular targeting signal peptide not normally associated with the catalytic domain of (c) and selected to target the second enzyme to the ER or Golgi apparatus of the host cell;

whereby, upon passage of the recombinant glycoprotein through the ER or Golgi apparatus of the host cell, a recombinant glycoprotein comprising a $GlcNAcMan_5GlcNAc_2$ glycoform is produced.

72. (currently amended) The method of any one of claims [claim]70, 71, 79 and 80, further comprising the step of introducing into the host cell a nucleic acid encoding a UDP-GlcNAc transporter.

73. (currently amended) The method of any one of claims 35, 40, 70, 71, 79 or 80[54], further comprising the step of analyzing a glycosylated protein or isolated *N*-glycan produced in the host cell by one or more methods selected from the group consisting of: (a) mass spectroscopy[such as MALDI-TOF-MS]; (b) liquid chromatography; (c) characterizing cells using a fluorescence activated cell sorter, spectrophotometer, fluorimeter, or scintillation counter; (d) exposing host cells to a lectin or antibody having a specific affinity for a desired oligosaccharide

moiety; and (e) exposing cells to a cytotoxic or radioactive molecule selected from the group consisting of sugars, antibodies and lectins.

74. – 78. (not entered)

79. (new) A method for producing a recombinant glycoprotein comprising an N-glycan comprising a $GlcNAcMan_3GlcNAc_2$ glycoform in a lower eukaryotic host cell genetically modified to produce N-glycan structures having an excess of 30 mole % of a $Man_5GlcNAc_2$ glycoform that are converted *in vivo* to a $GlcNAcMan_5GlcNAc_2$ glycoform by GlcNAc transferase I activity localized in the ER or Golgi apparatus of the host cell, the method comprising the step of introducing into the host cell a nucleic acid encoding a mannosidase II enzyme comprising:

(a) a catalytic domain having mannosidase II activity selected to have a pH optimum within 1.4 pH units of the average pH optimum of glycosylation-related enzymes in a subcellular location where the domain is targeted; and

(b) a cellular targeting signal peptide not normally associated with the catalytic domain selected to target the mannosidase II enzyme to the ER or Golgi apparatus of the host cell;

whereby, upon passage of the recombinant glycoprotein through the ER or Golgi apparatus of the host cell, a recombinant glycoprotein comprising a $GlcNAcMan_3GlcNAc_2$ glycoform is produced.

80. (new) A method for producing a recombinant glycoprotein comprising an N-glycan comprising a $GlcNAc_2Man_3GlcNAc_2$ glycoform in a lower eukaryotic host cell genetically modified to produce N-glycan structures having an excess of 30 mole % of a $Man_5GlcNAc_2$ glycoform that are converted *in vivo* to a $GlcNAcMan_3GlcNAc_2$ glycoform by GlcNAc transferase